Comparison of the effectiveness of four materials used in constructing coverboards for sampling amphibians during their terrestrial phases in a Cambridge allotment

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Most of the effort devoted to monitoring amphibians in temperate climates has focused on the relatively short aquatic phases of their life cycle. As most amphibians in these areas spend a substantial fraction of their lives on land, methods for sampling populations during these phases will be of some importance. Such methods are not as well-developed as those for the aquatic phases, and there are not, as yet, generally-accepted procedures for sampling amphibians on land (see Beebee, 2013, for example).

The work reported here formed part of a larger study of amphibians during their terrestrial phases in a number of allotments in Cambridge (UK). Four species were found in this habitat: common frog (*Rana temporaria*), common toad (*Bufo bufo*), palmate newt (*Lissotriton helveticus*) and great crested newt (*Triturus cristatus*). Great crested newts are rare in this habitat and are not considered further in this note. All amphibians found were assigned to the categories sub-adult (metamorphs or juveniles) or adult, based mainly on size and colour.

Amphibians in all six categories (see Table 1) were sampled using coverboards (also sometimes called artificial cover objects or mats) at an allotment south-east of central Cambridge. Each coverboard measured 0.5 x 0.5 m and was constructed of non-nylon backed wool fibre carpet (carpet), untreated 9 mm thick plywood (wood), roofing felt (felt) or 1000-guage black polyethylene (plastic). The coverboards were distributed as widely and evenly as possible on a variety of substrates, including grass, concrete, scrub, dirt and ivy. Grouping depended on available space, and was either lengthwise (as in Fig. 1) or two-by-two to form a large square. The coverboards were put in position on 4th February 2017, they were then examined on 12 occasions between 25 February and 30 July.

Overall, 116 amphibians were found beneath the coverboards. Table 1 shows the total numbers of common frogs, common toads and smooth newts, both juveniles and adults, utilising the four materials, expressed as percentages of the total for each category. Because of small sample sizes, very few of the differences in numbers of amphibians between materials were significant at $P<0.05$ (univariate analysis) of raw data utilising the bootstrap option in SPSS, Field, 2012). The overall pattern, however, is clear: carpet was the most utilised material in all six cases, being responsible for 55% of the amphibians found. Plastic was the least utilised material in three out of six cases.

Figure 1. The coverboards, from left to right: plastic, carpet, roofing felt and wood

Table 1. Total numbers and percentages of amphibians in six categories found beneath coverboards constructed from four different materials. Newts refers to *L. helveticus*. Significant differences are denoted by asterisks.

	Total number found	Material			
		Carpet	Wood	Felt	Plastic
Juvenile frogs	34	68*	21	0	12
Adult frogs	5	60	40	0	0
Juvenile toads	24	29	13	29	29
Adult toads	7	57	0	14	29
Juvenile newts	18	61	17	17	6
Adult newts	28	57*	14	21	7

It has been well-known for many years that the materials from which they are constructed may affect the ability of cover boards to attract reptiles and amphibians (e.g. Hampton, 2007); the reasons may be complex (e.g. Grant et al., 1992). Why was carpet more successful than the other three materials at attracting amphibians at this allotment site? It may be significant that 2017 was a relatively dry year in Cambridge. Carpet retains moisture well, and therefore even in the drier months provided a moist microclimate. The other materials prevent rainfall from reaching the ground and so produce a drier microclimate unless rainfall has been particularly high. This may explain why the results reported here contradict those of Scheffers et al., (2009), which showed that wood attracted more amphibians than carpet at a site in Missouri.

The study reported here is very much a preliminary one and is based on small sample sizes. Nevertheless, in view of the fact that there are as yet no generally accepted, standardised methods for sampling amphibians using coverboards during their terrestrial phases (partly because the detailed requirements seem to vary between habitats), the data may well prove useful to other workers when devising methods that are relevant to the particular circumstances of the habitats that they are sampling.

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